

# MODIS L1B Validation for Thermal Bands

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# MODIS L1B Validation Sources

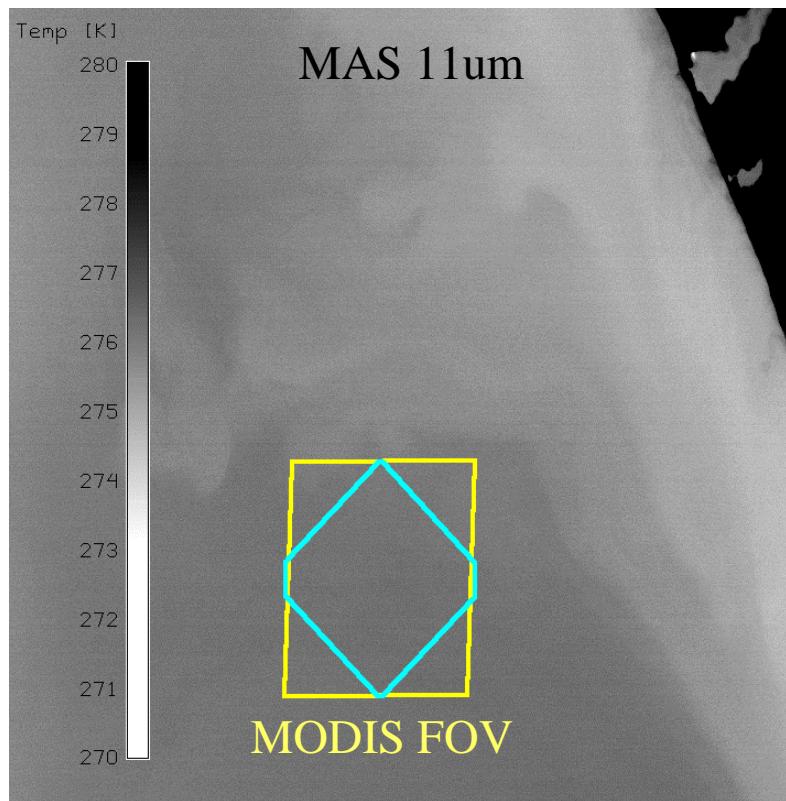
## Thermal Bands

- GOES and other Satellite Platforms
- ER-2 Aircraft Based Campaigns
- Ground Based AERI measurements
- Special Radiosondes / IOPs

# MODIS Emissive Band Cal/Val from ER-2 Platform



MAS  
S-HIS

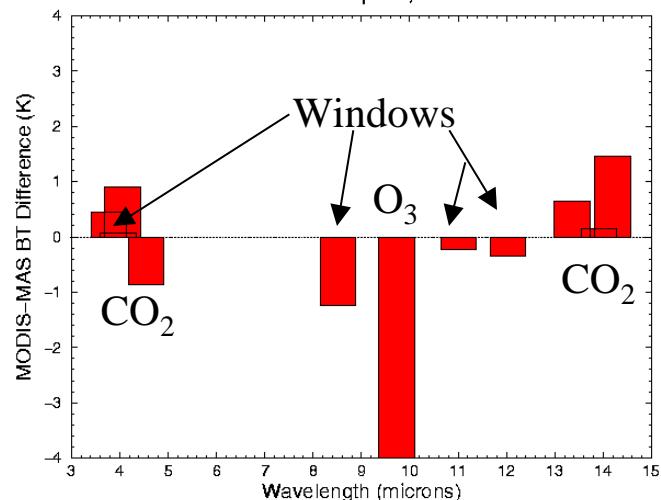


Purpose:  
Validate MODIS L1B

- Transfer S-HIS cal to MAS
- Collocate MODIS FOV on MAS
- Remove spatial, spectral and viewing geometry dependencies

## MODIS L1B Validation; Corrected MAS MODIS Comparisons

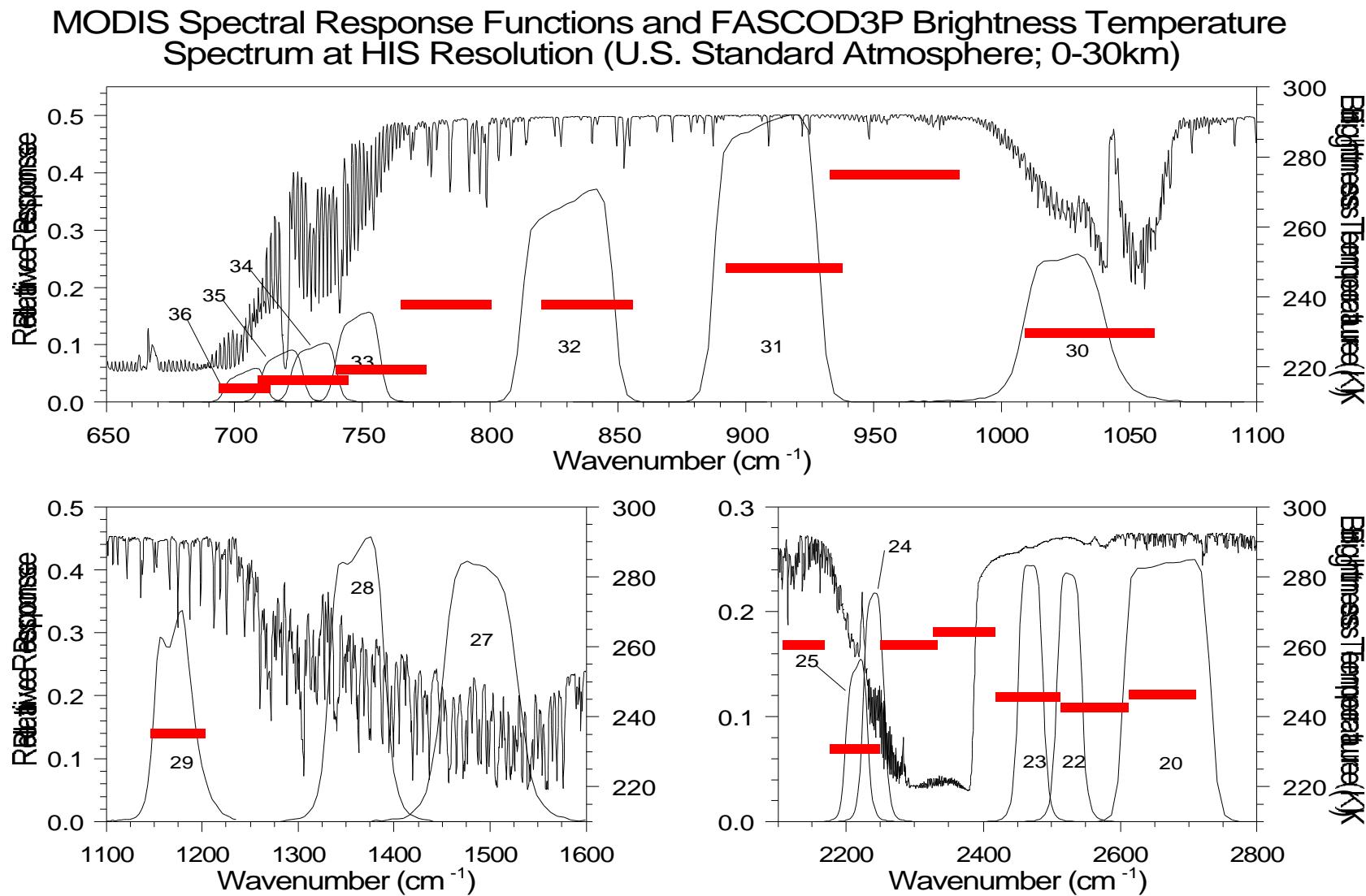
Based on 446 colocations on Sept. 11, 2000 over Atlantic Ocean

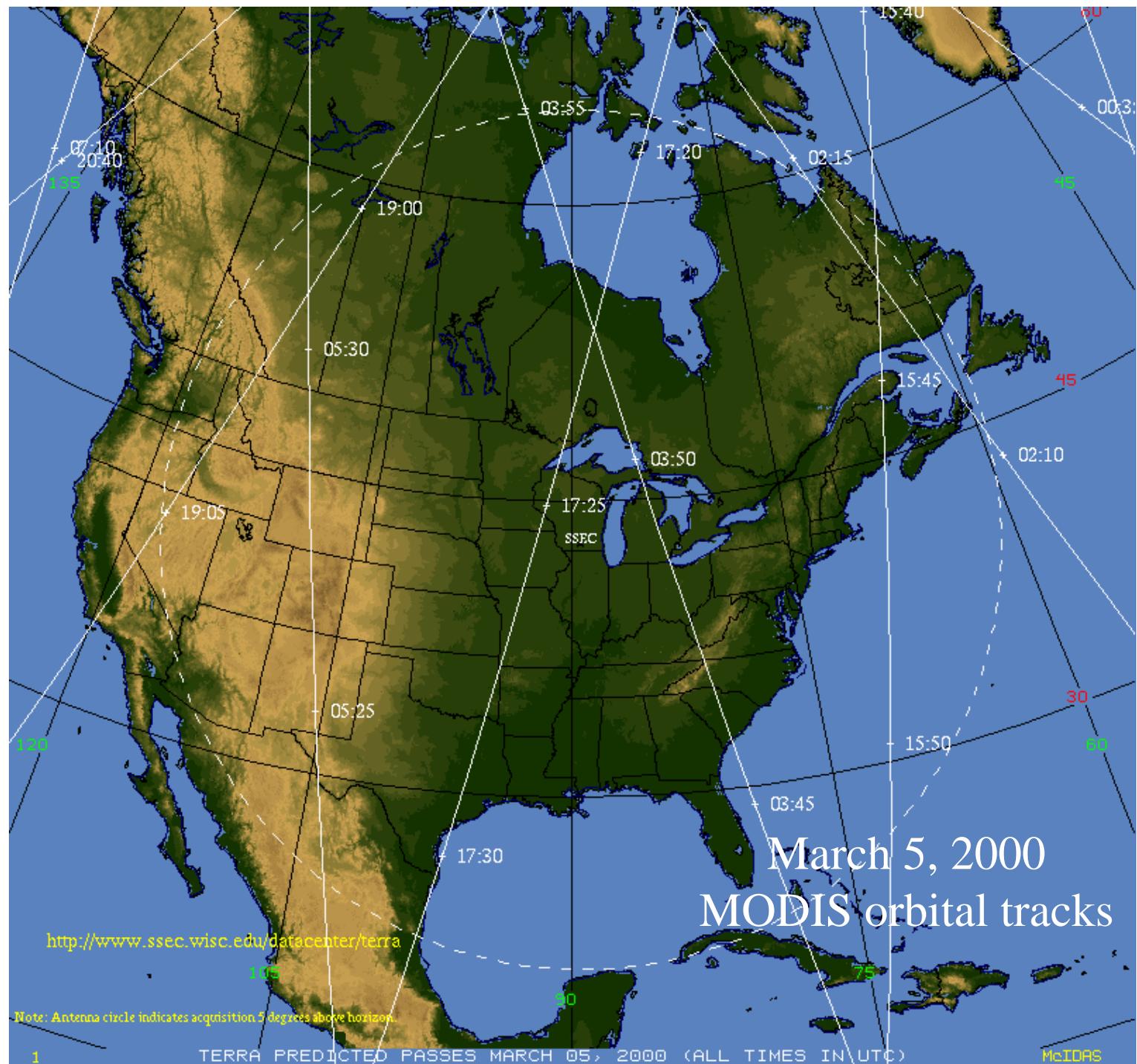


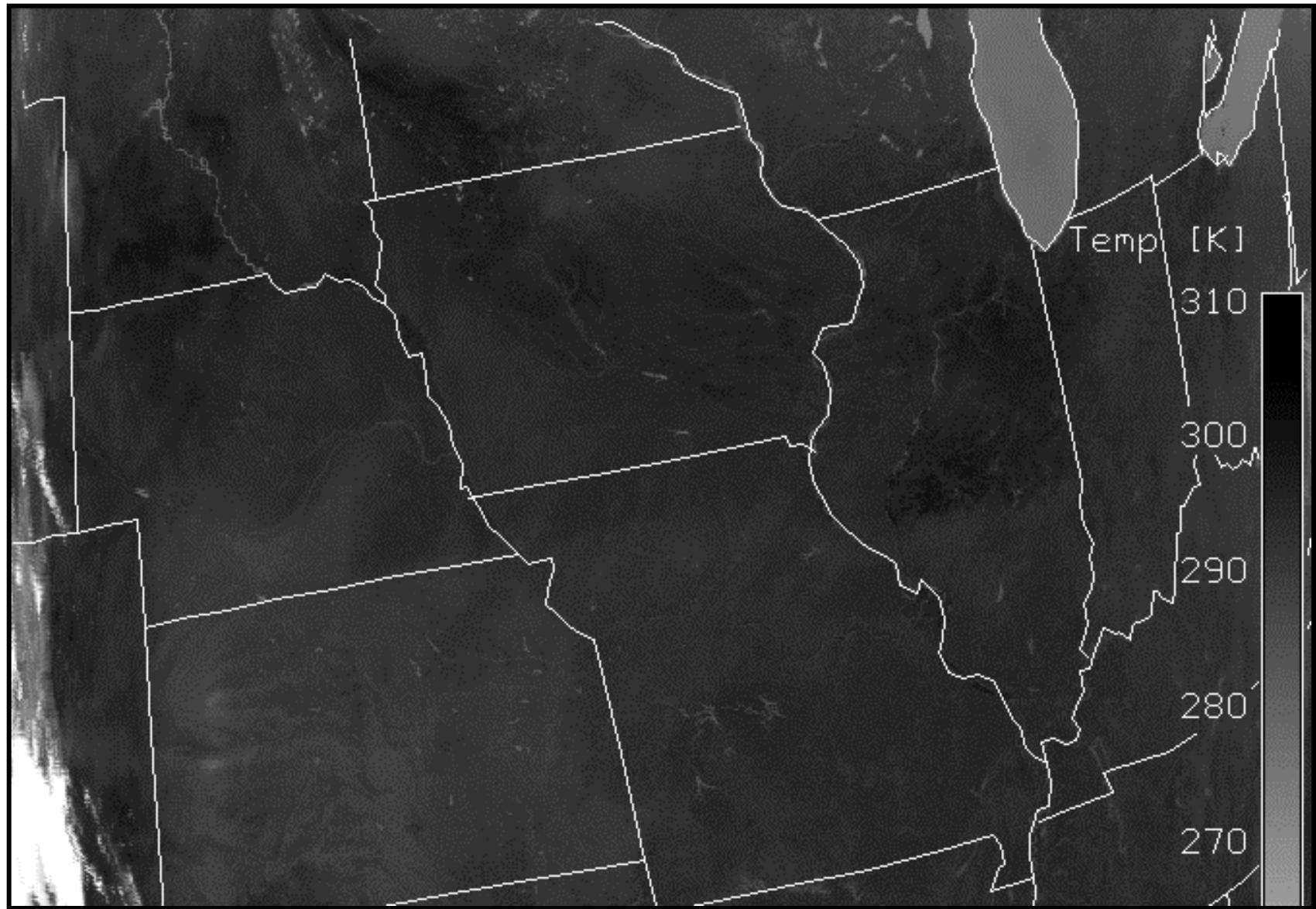
# ER-2 Based L1B Validation

- Payload:
  - SHIS:  $< 0.5 \text{ cm}^{-1}$  spectral res.;  $0.5^\circ\text{C}$  accuracy
  - MAS: 50 m spatial res.;  $+/- 43^\circ$  view
  - CPL: nadir viewing lidar for cirrus detection
- Procedure:
  - transfer SHIS calibration to MAS
  - integrate MODIS spatial function over MAS
  - remove spectral, altitude, viewing geometry dependence
- Field Campaigns      Dates      Location
  - WISC-T2000      Feb 27 - Mar 13, 2000      Madison, WI
  - SAFARI-2000      Aug 13 - Sep 25, 2000      Pietersburg, SA
  - CLAP-T2000      Mar 14 - Apr 05, 2000      San Antonio, TX

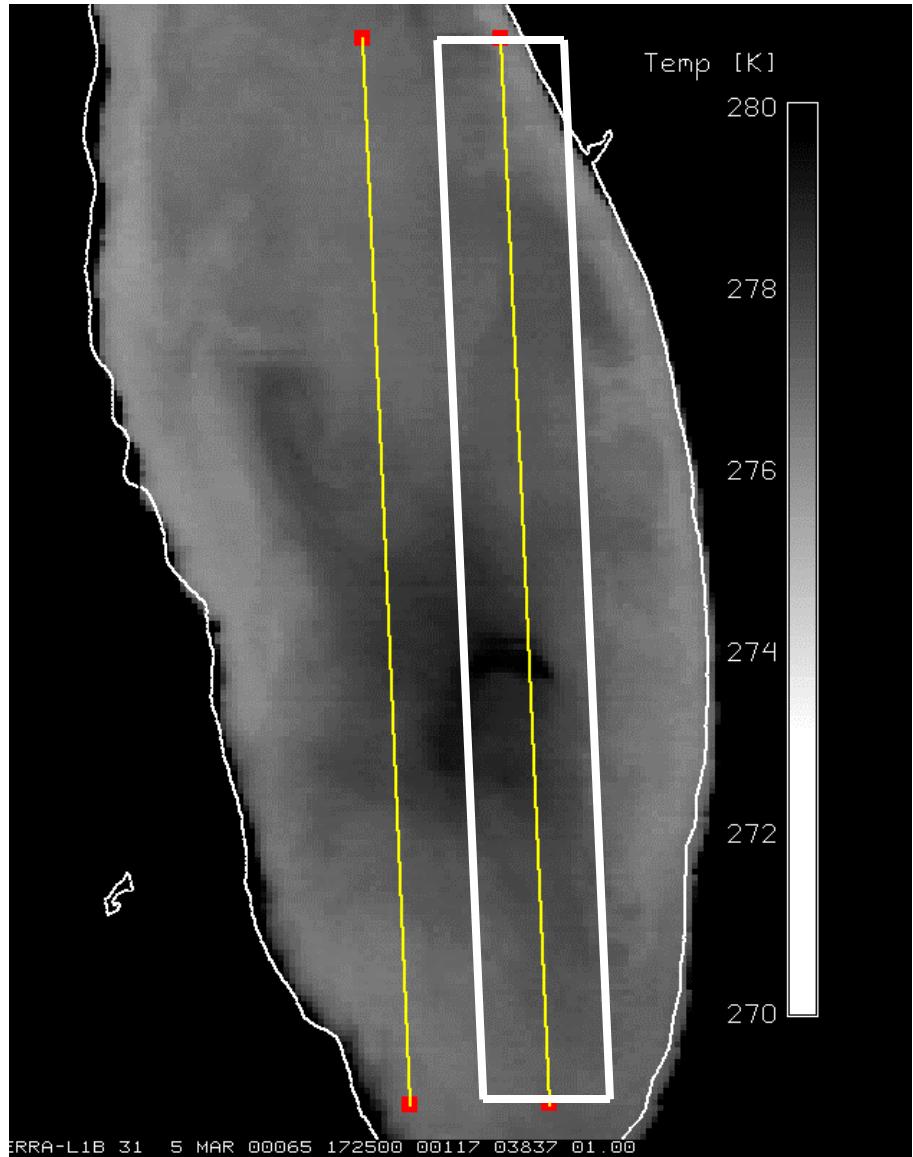
# MODIS IR Spectral Bands, MAS FWHM



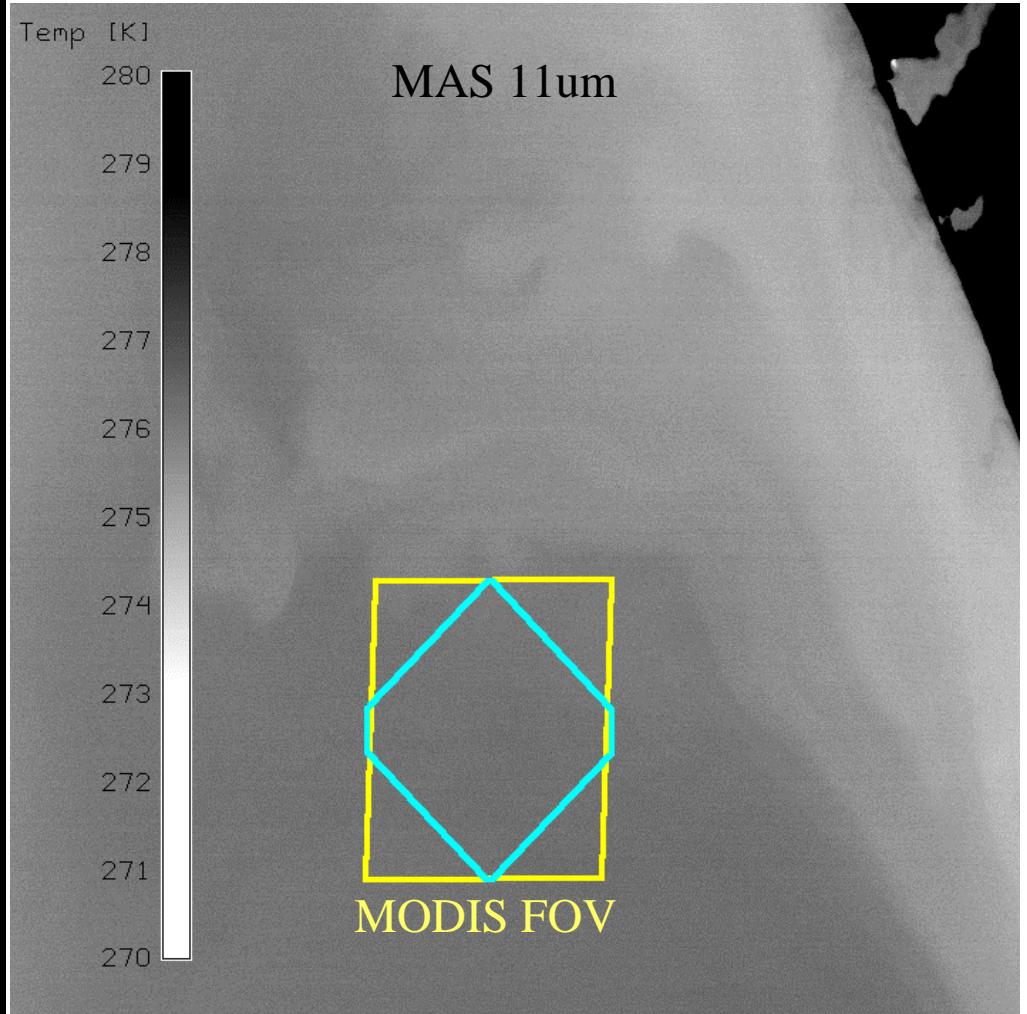




**MODIS 11um Imagery**  
**March 5, 2000;17:25 UTC**

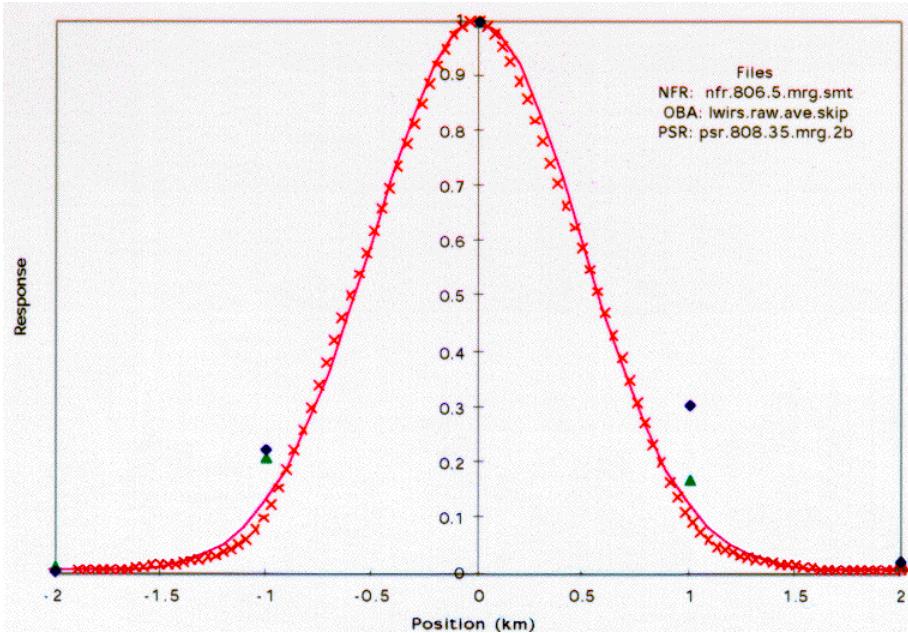


**ER-2 Flight 00-067**  
**March 5, 2000**  
**WISC-T2000 Campaign**

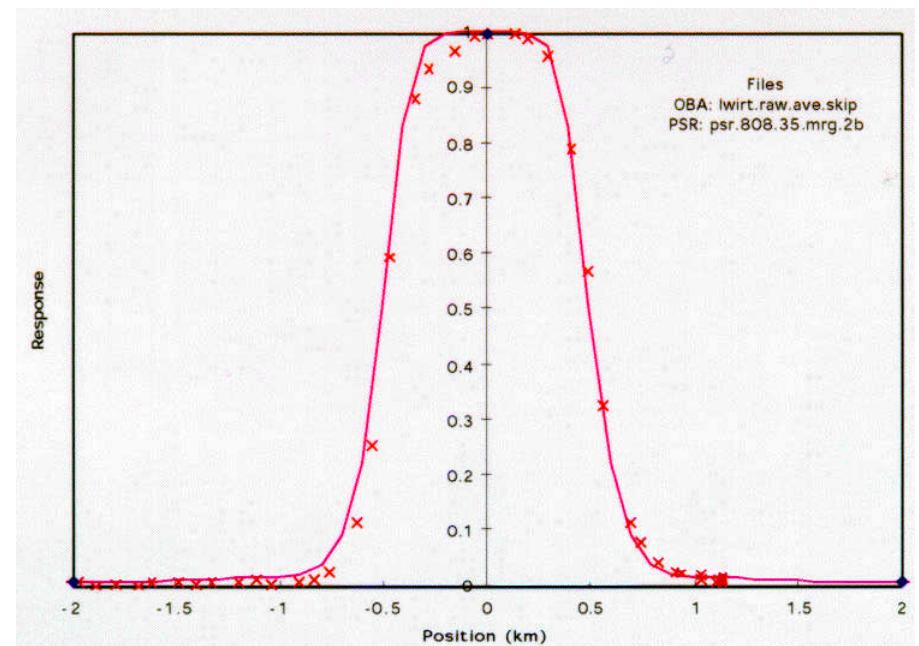


**Example of a MODIS FOV collocated  
on MAS March 5, 2000 imagery**

## SCAN

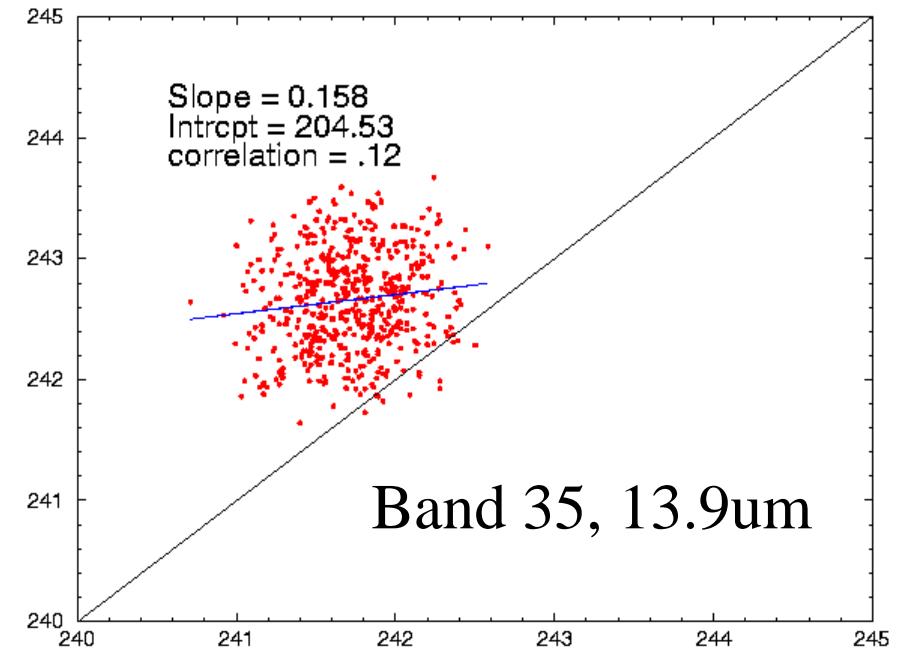
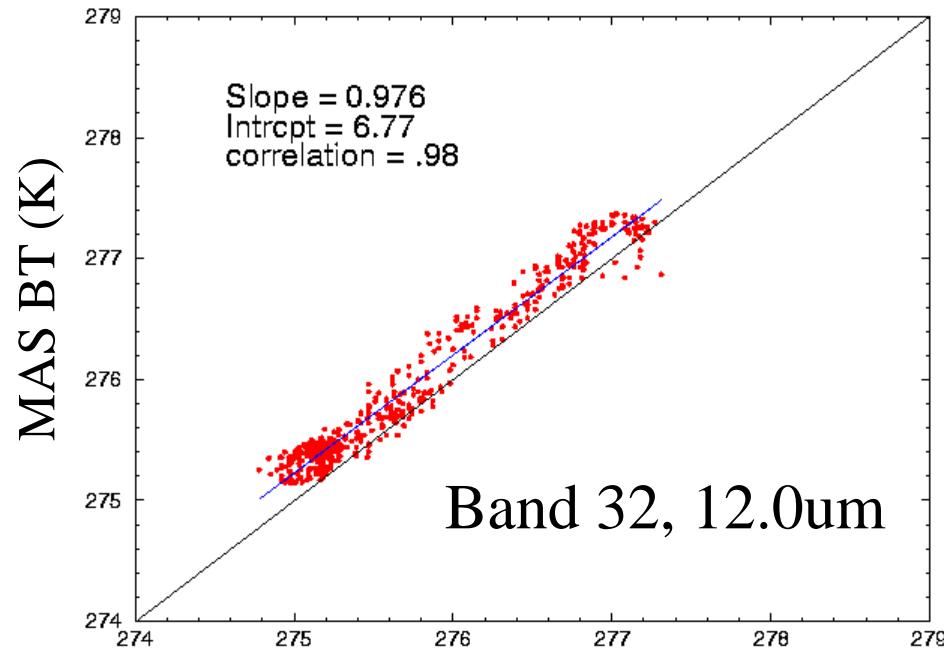
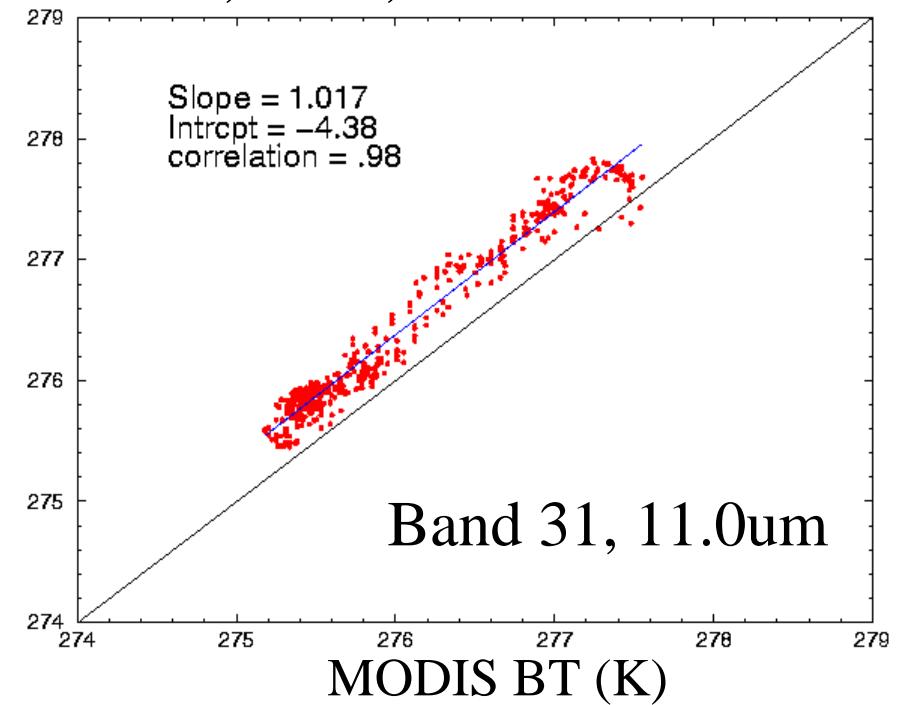
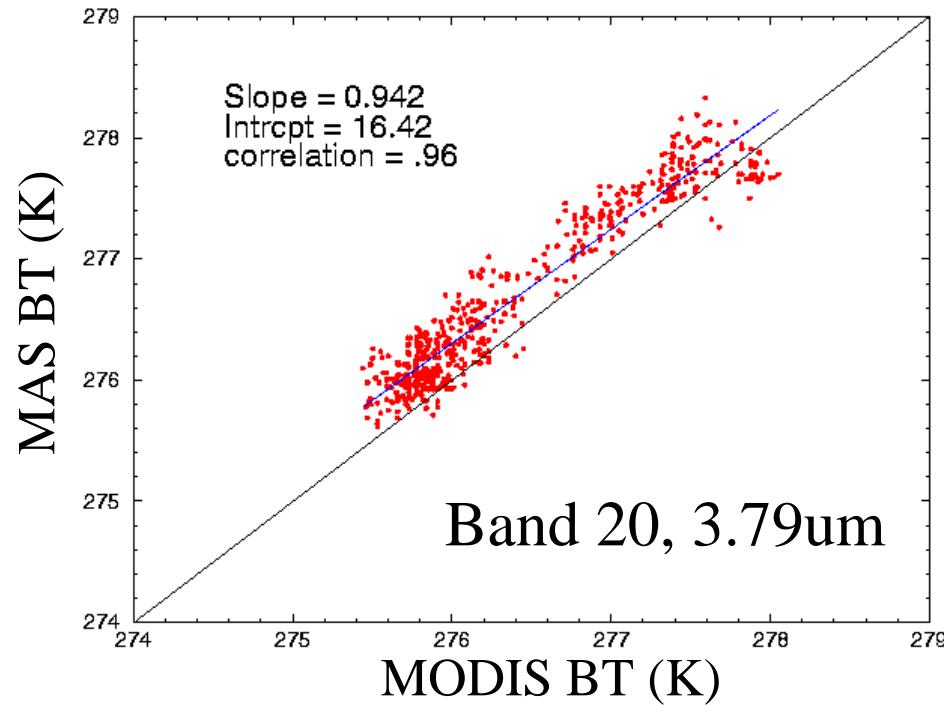


## TRACK

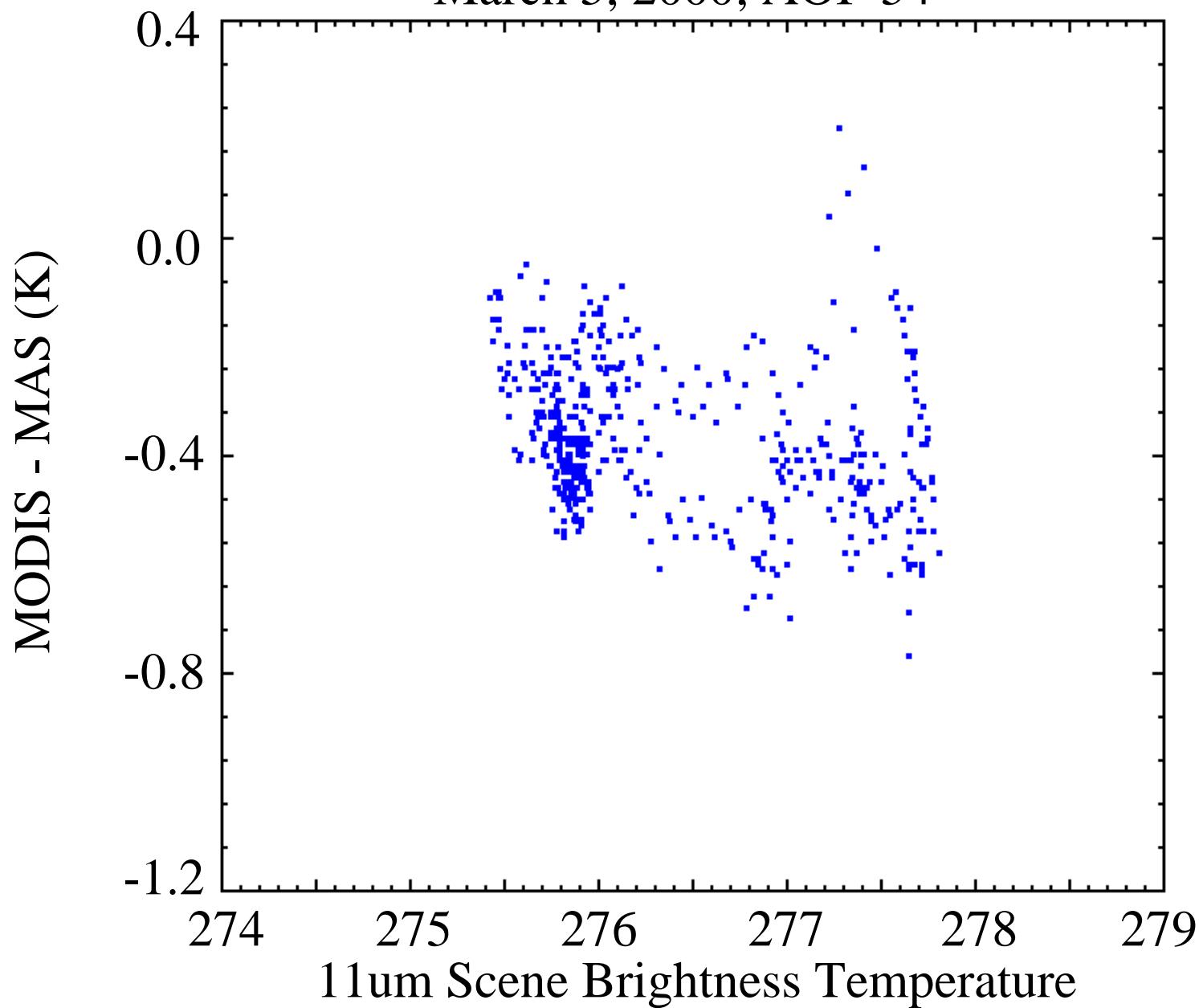


The MODIS spatial weighting function was measured in the scan and track directions during prelaunch testing using a 0.1 x 10 FOV slit stepped across the MODIS focal planes. Idealized smearing was added to the scan direction measurements to simulate the effect of the scan mirror motion.

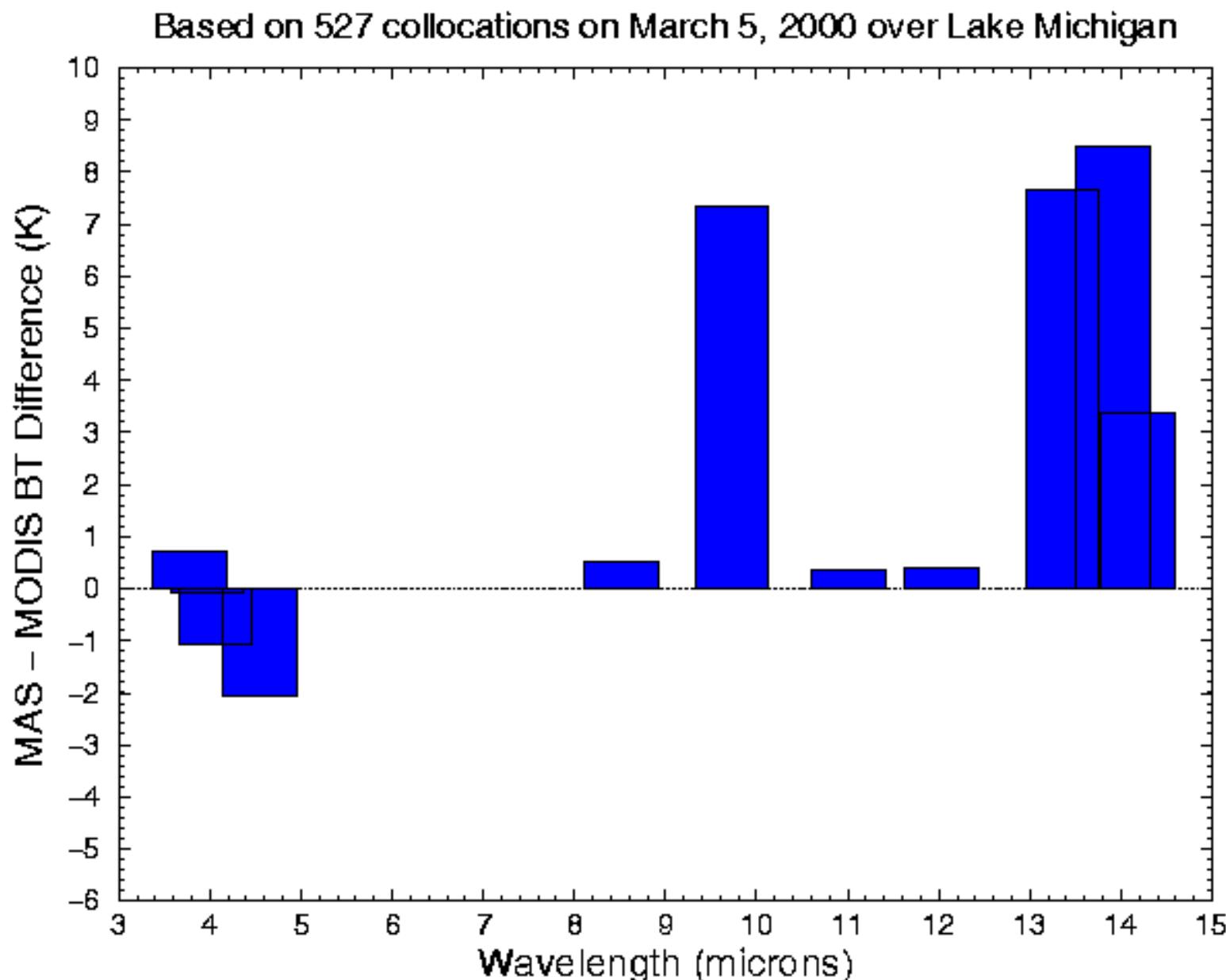
# MAS vs. MODIS Scatter Plots; March 5, 2000; WISC-T2000



MODIS 11um comparison to MAS  
March 5, 2000; AOI~54°

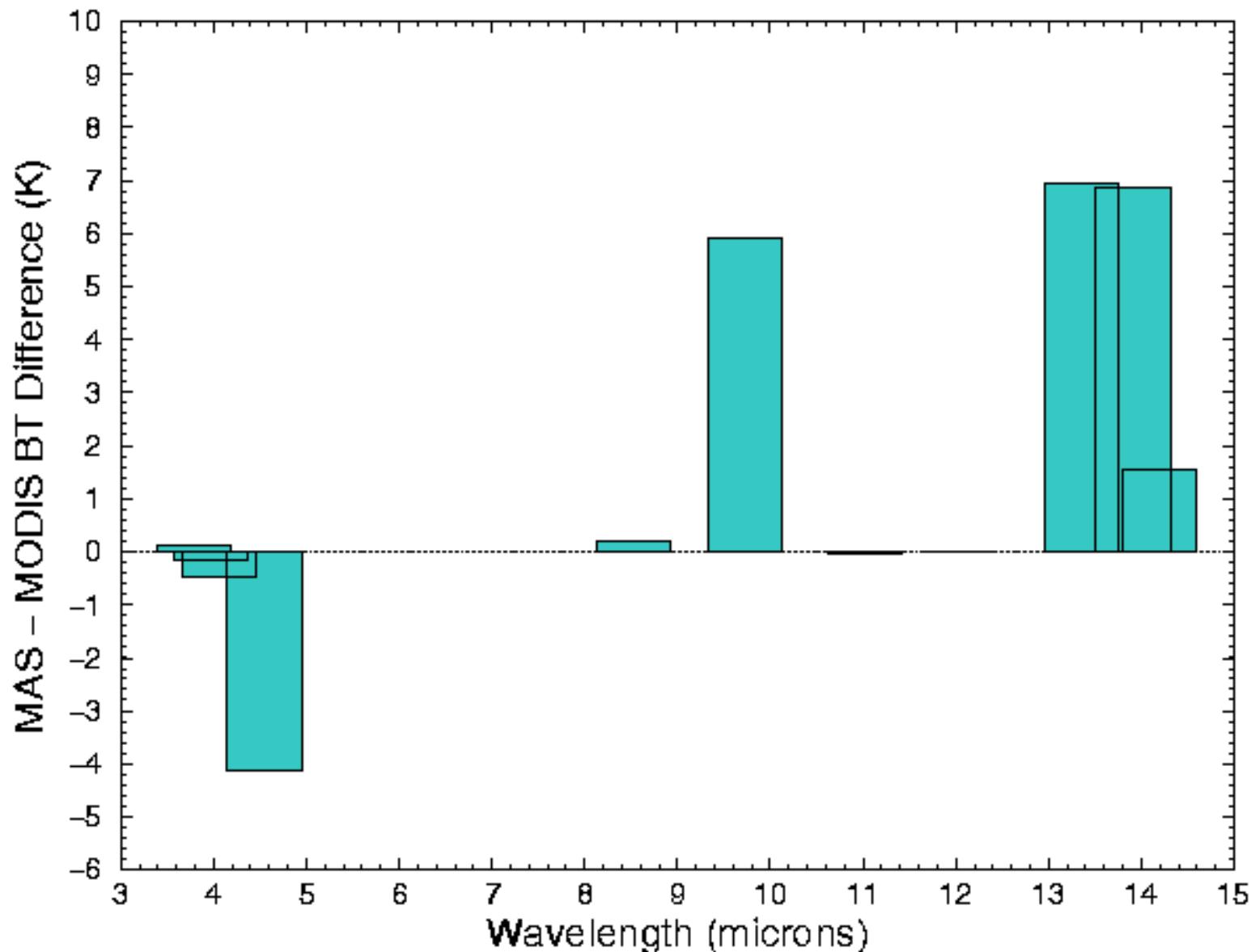


# MODIS L1B Validation; Uncorrected MAS MODIS comparisons

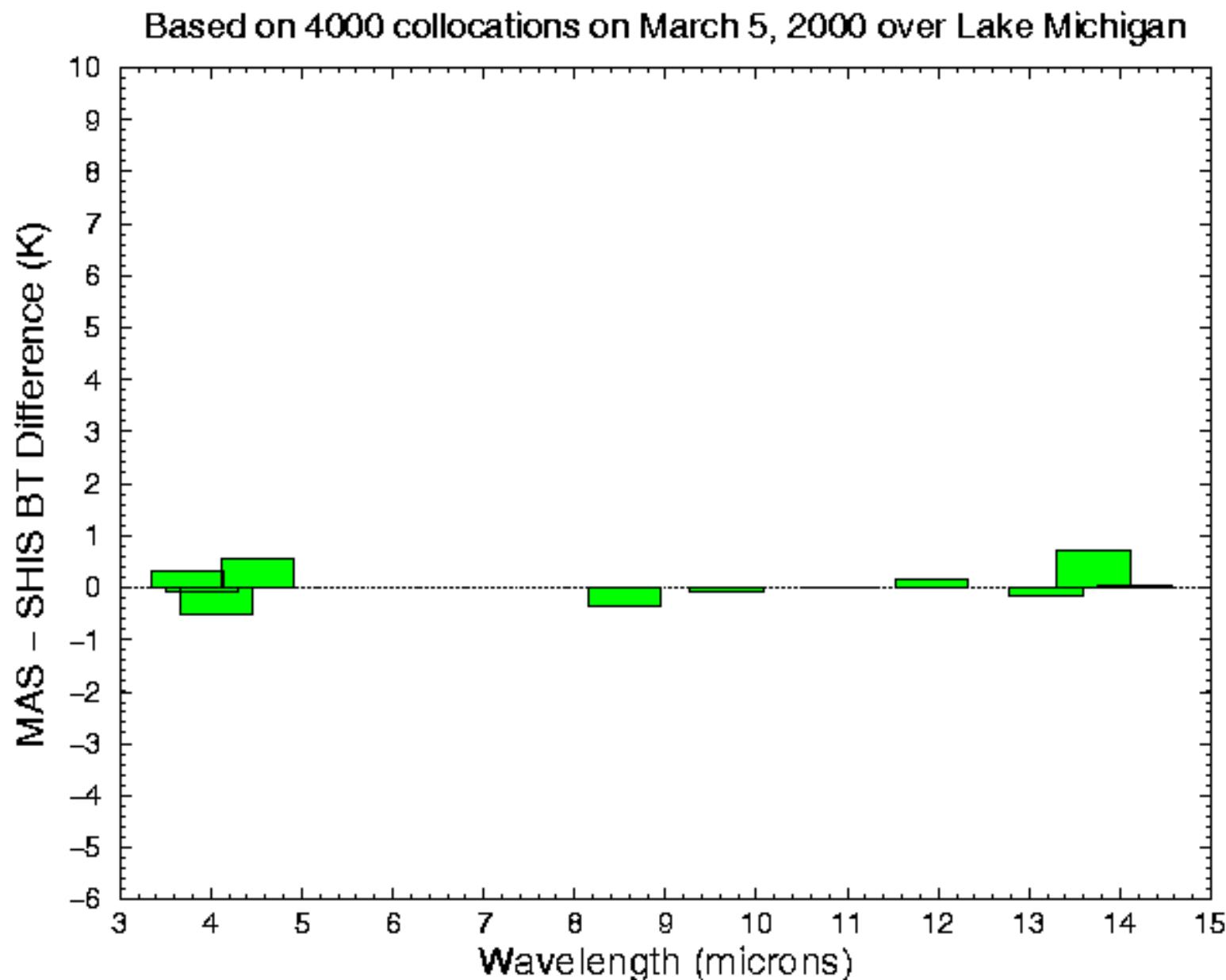


# MODIS L1B Validation; Spectral and Altitude Dependence

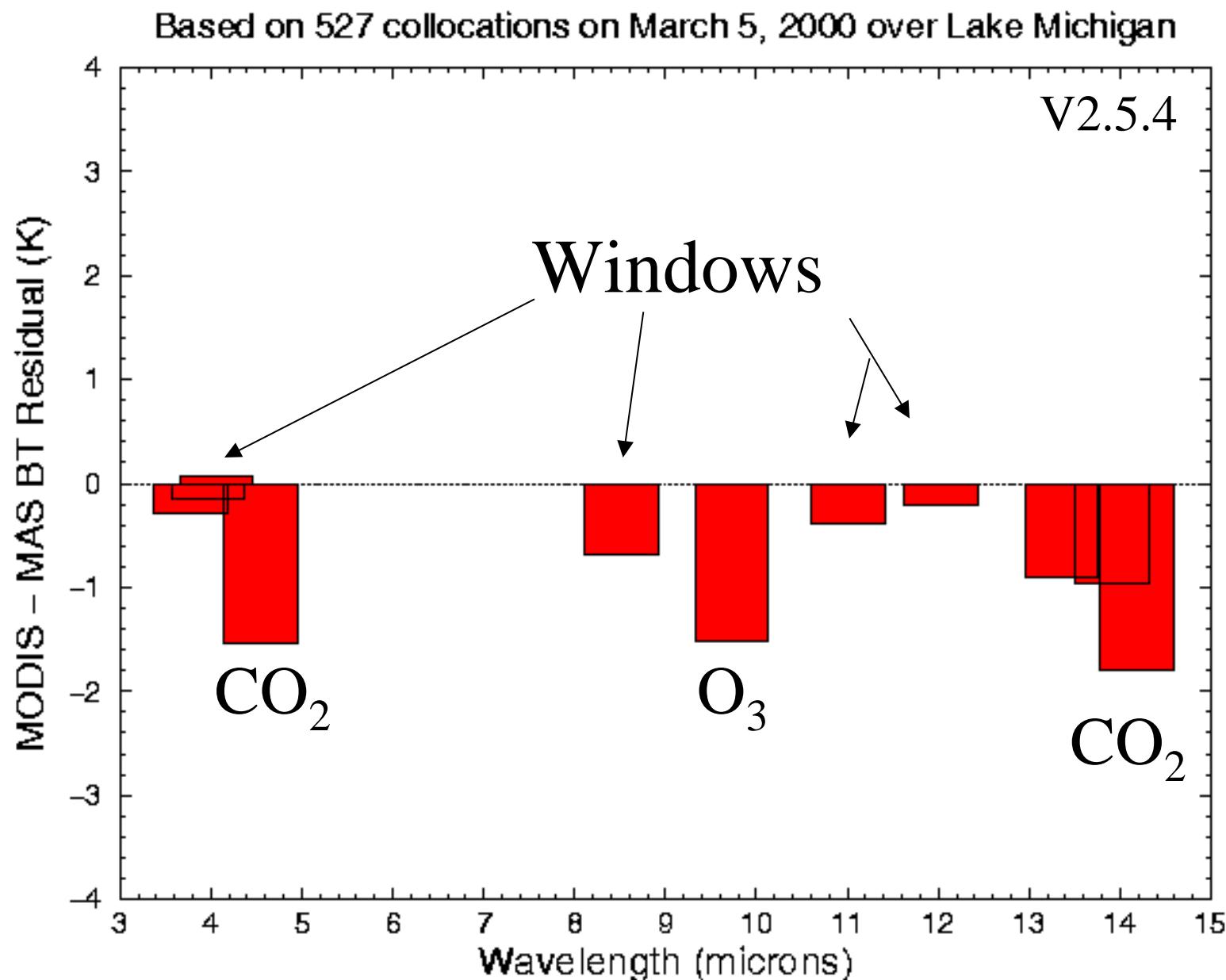
Based on GRB Radiosonde for Day 00066, 00 UTC



# MODIS L1B Validation; SHIS Calibration Transfer to MAS

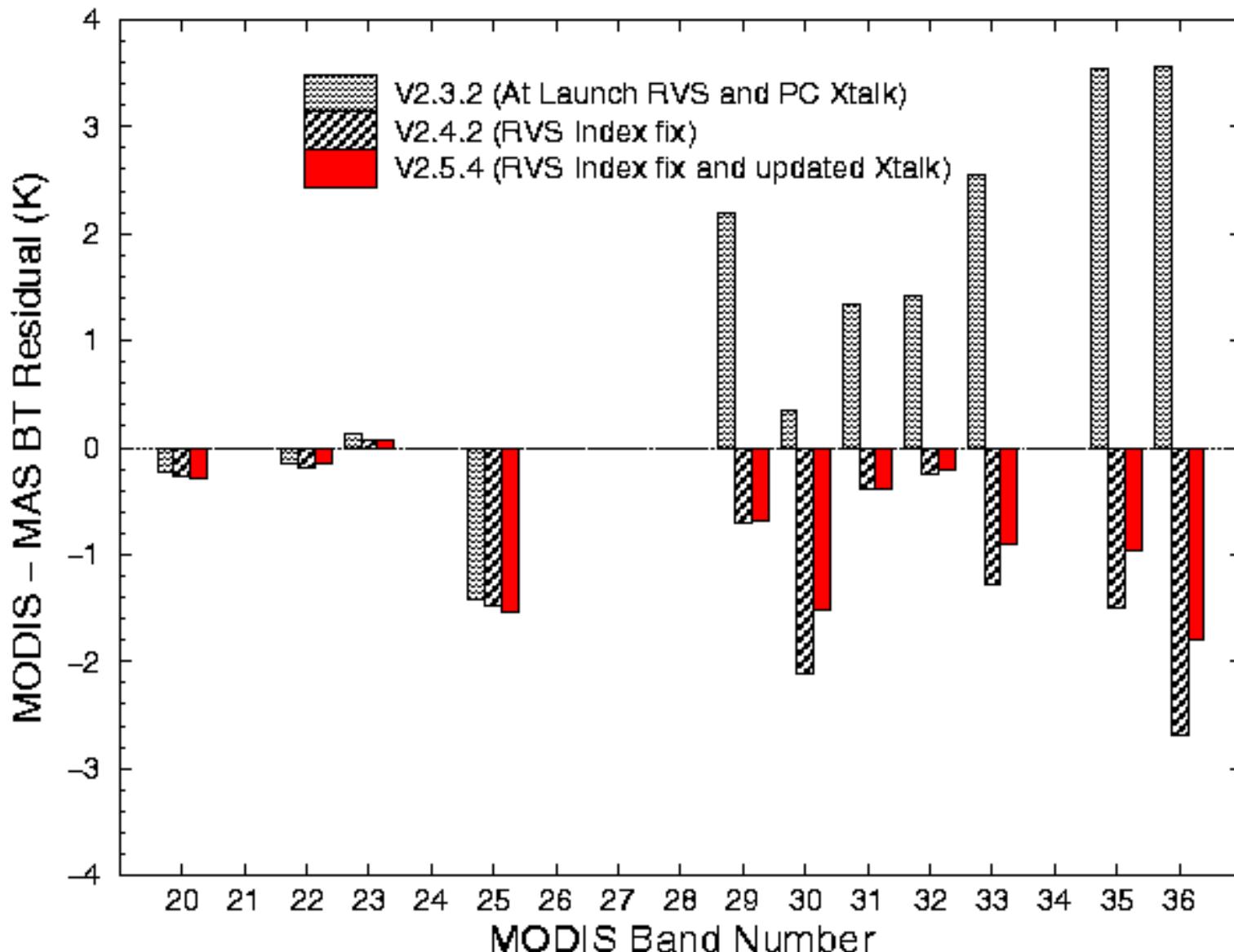


# MODIS L1B Validation; Corrected MAS MODIS comparisons

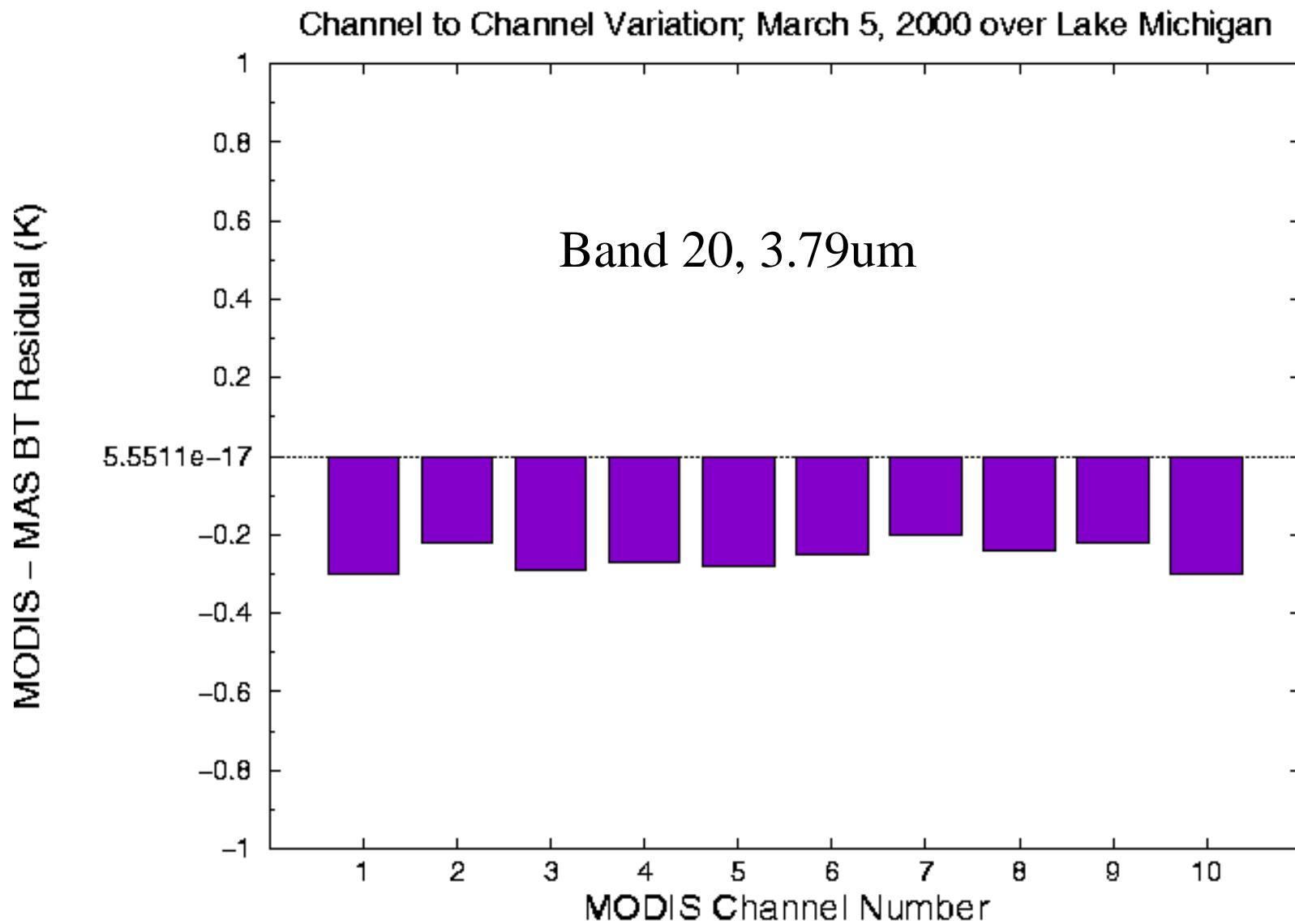


# MODIS L1B Emissive Band Comparisons: History

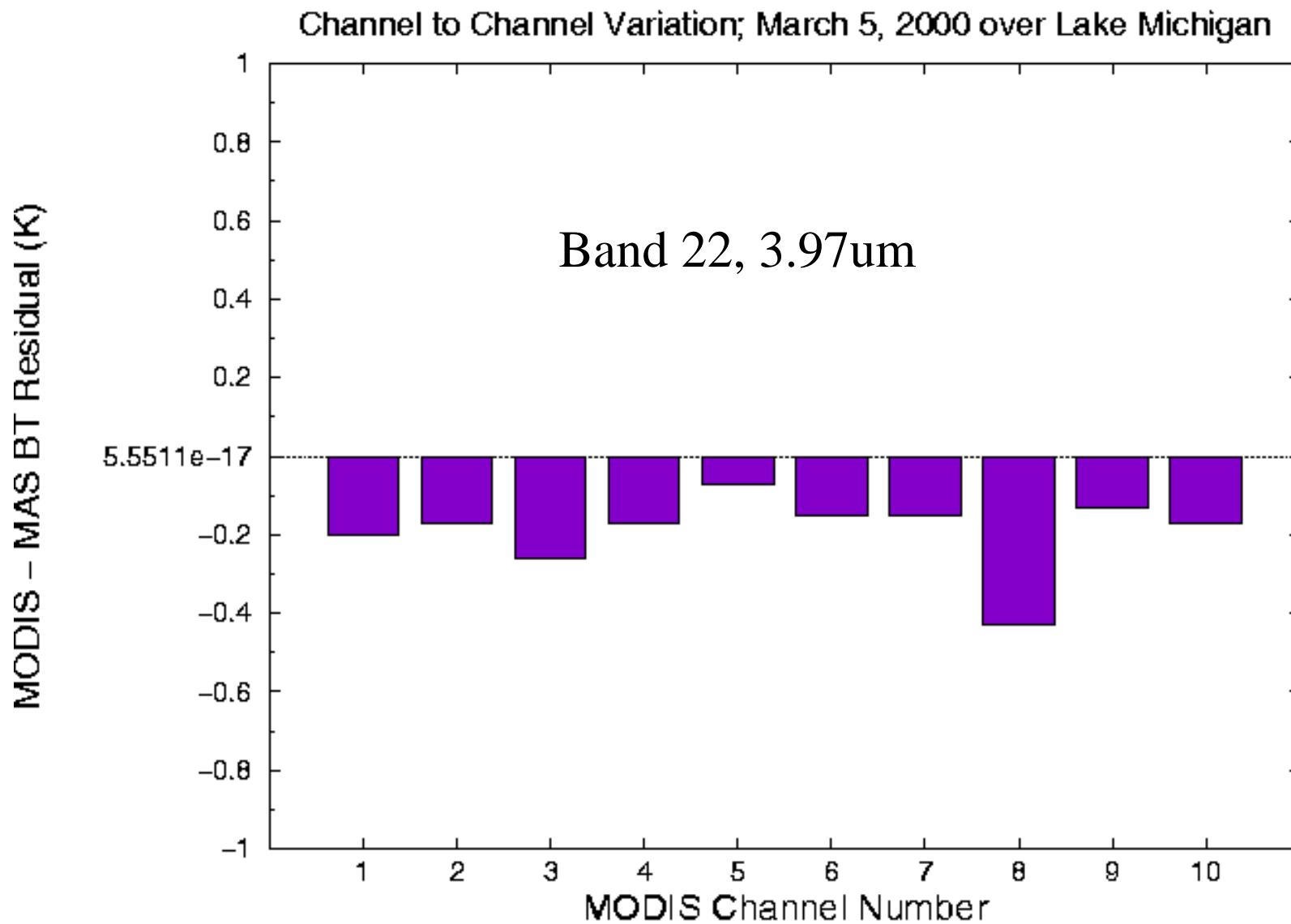
March 5 2000 over Lake MI; AOI~54 deg



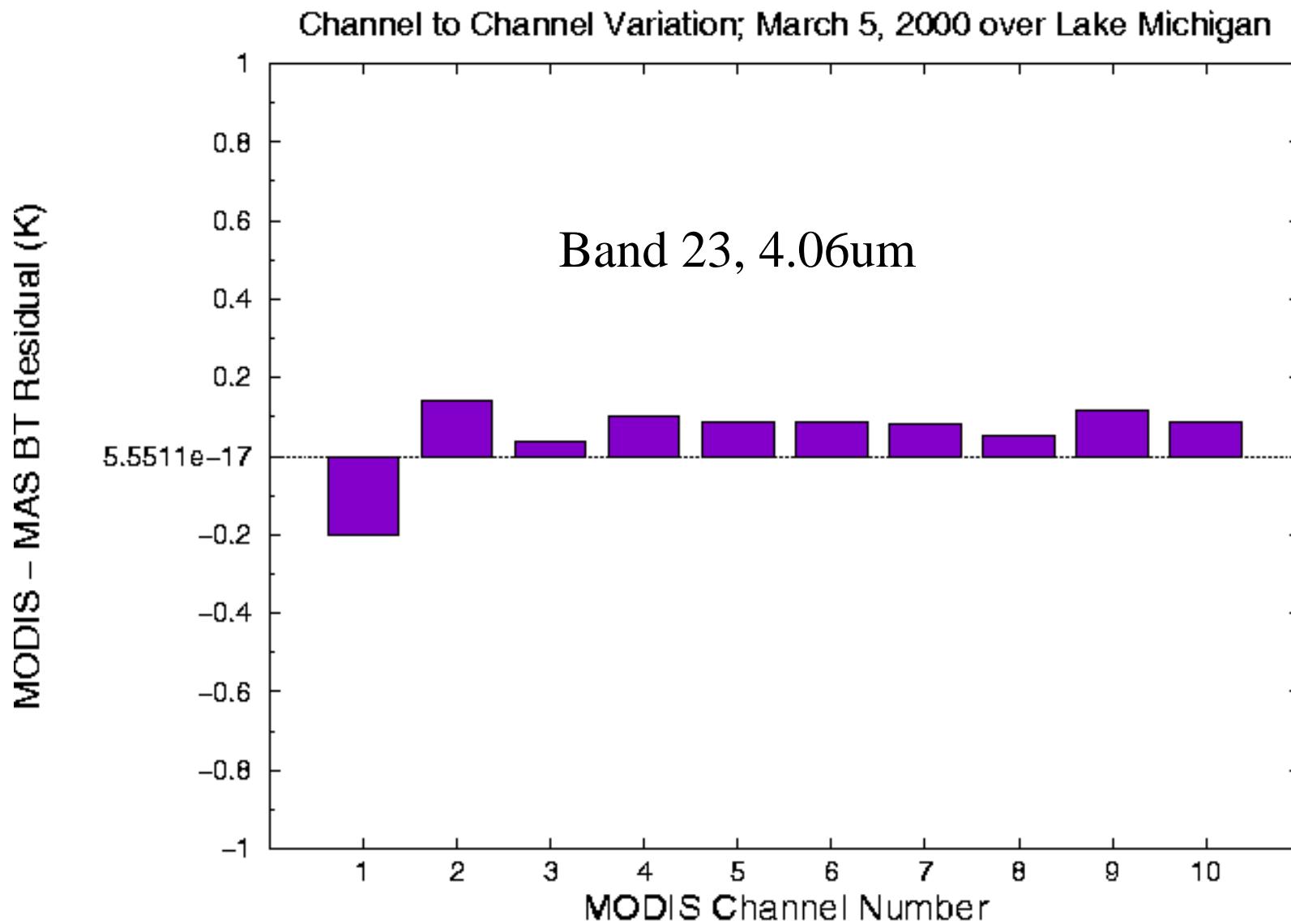
## MODIS L1B Validation; Corrected MAS MODIS comparisons



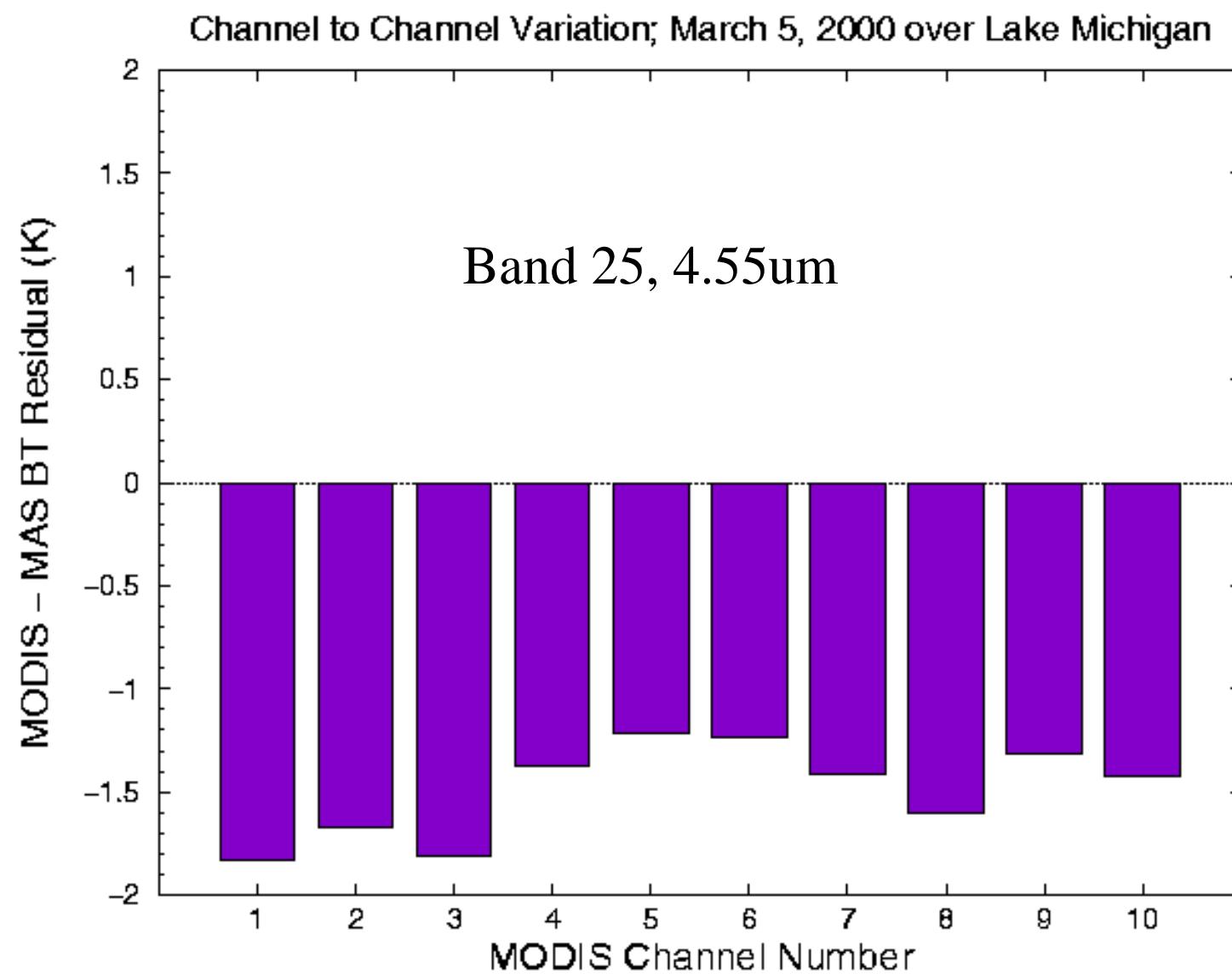
## MODIS L1B Validation; Corrected MAS MODIS comparisons



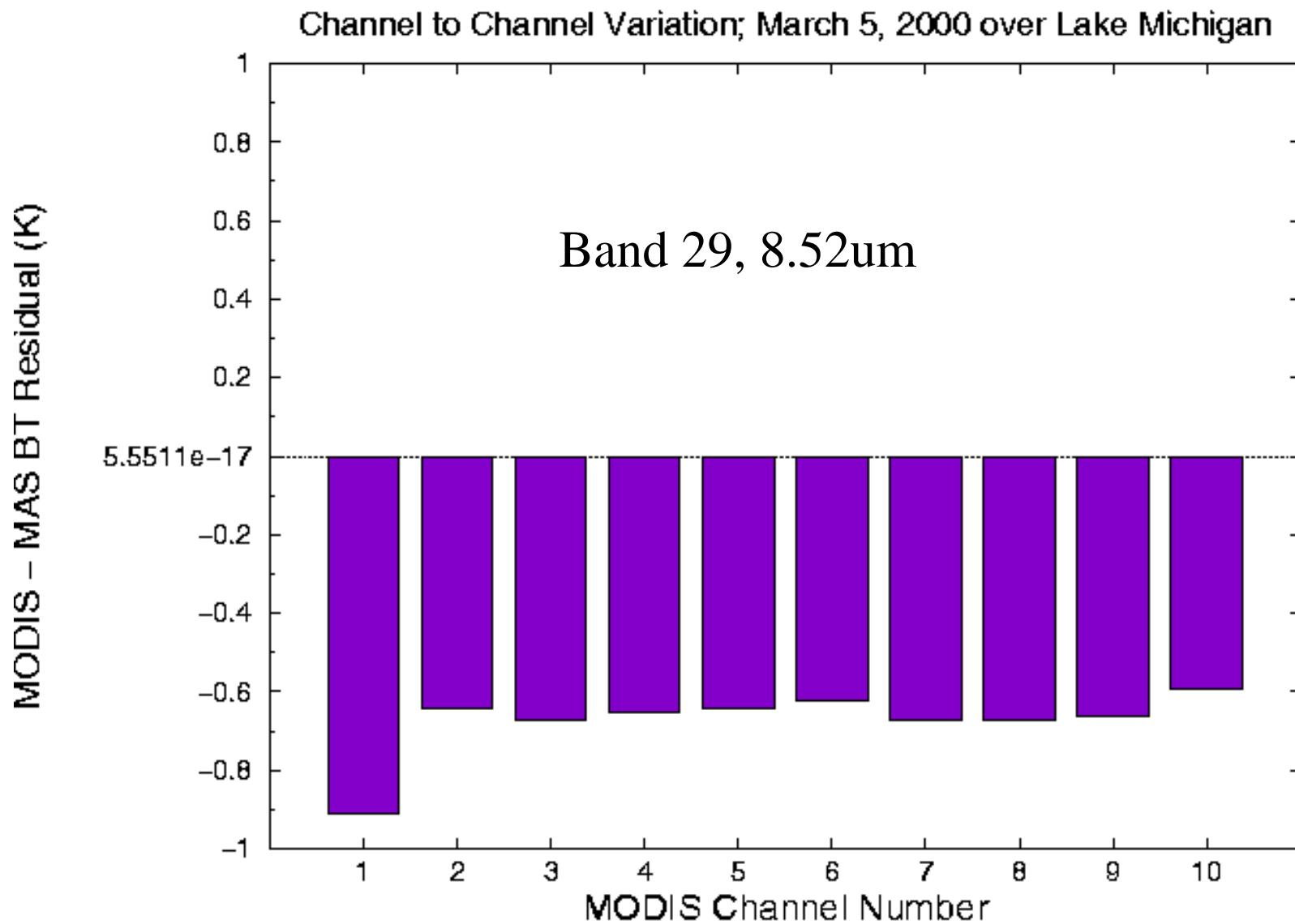
## MODIS L1B Validation; Corrected MAS MODIS comparisons



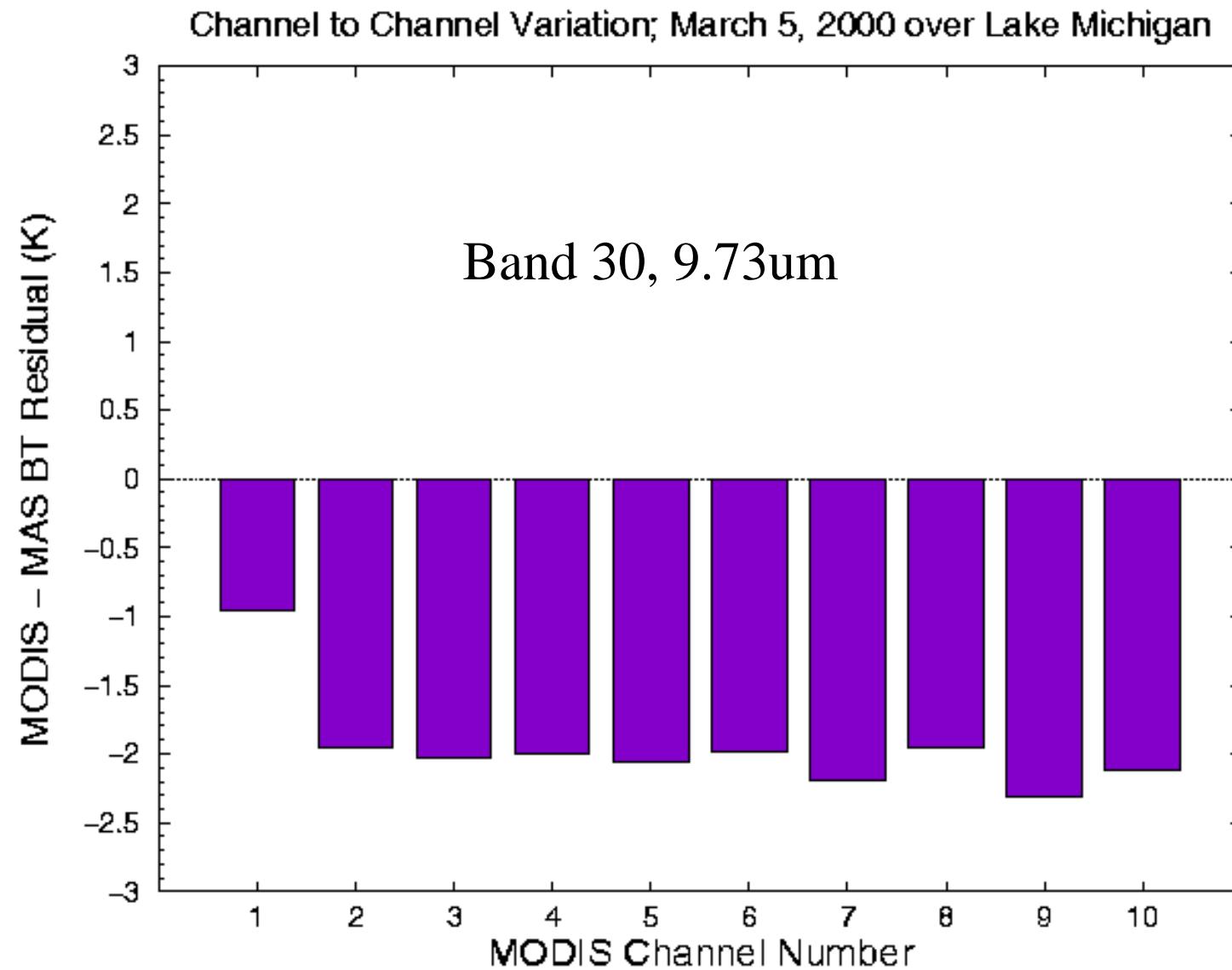
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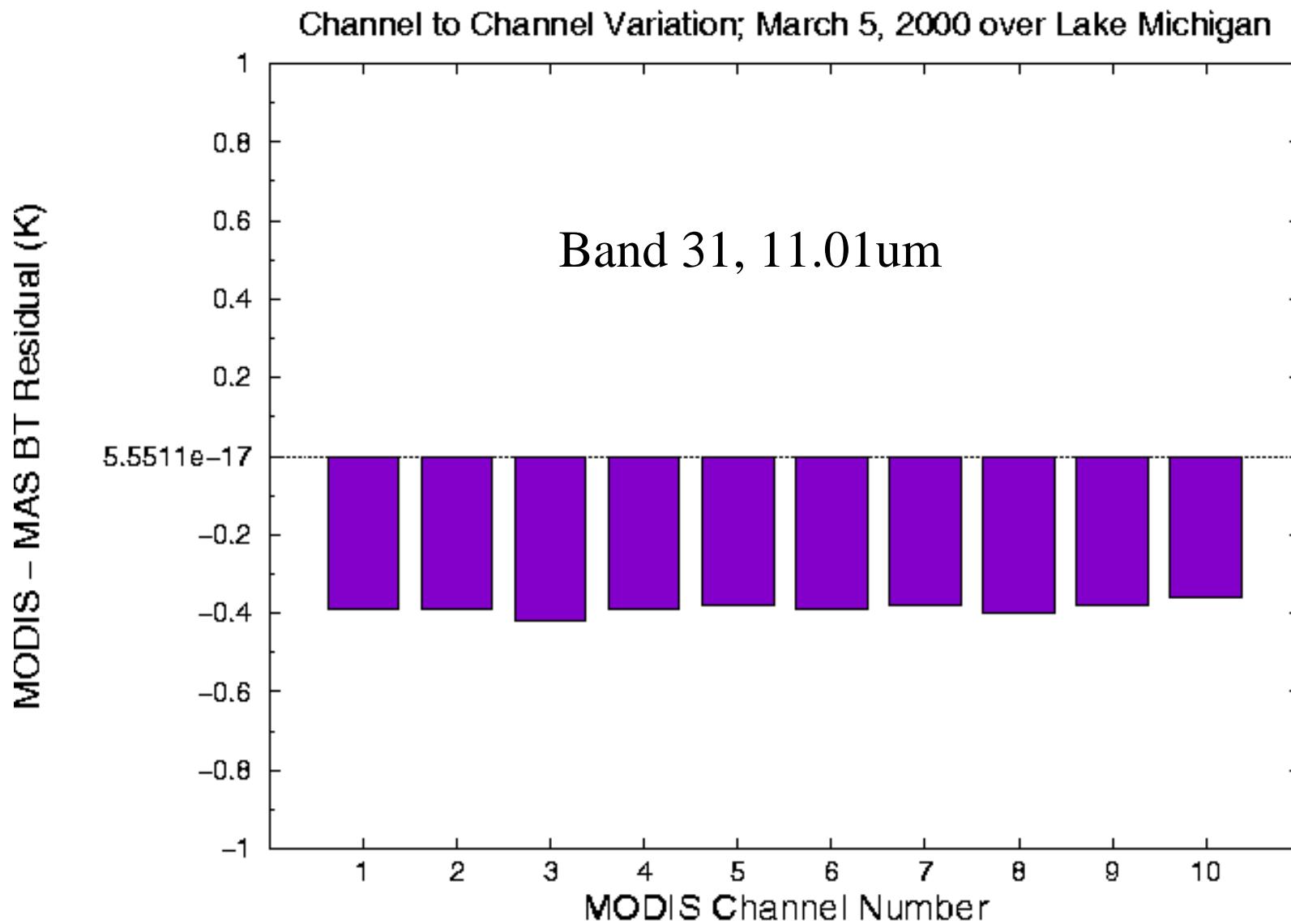
## MODIS L1B Validation; Corrected MAS MODIS comparisons



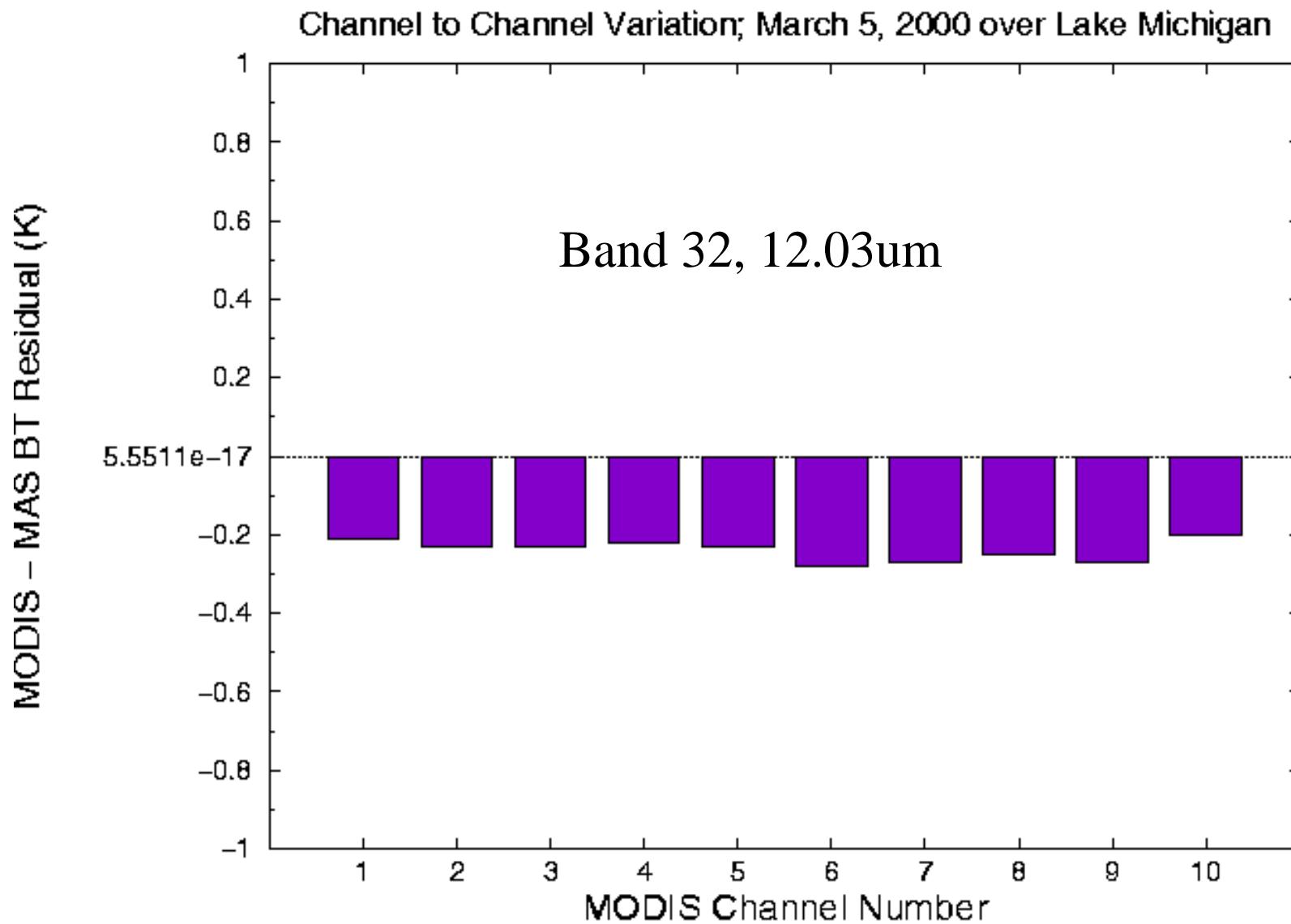
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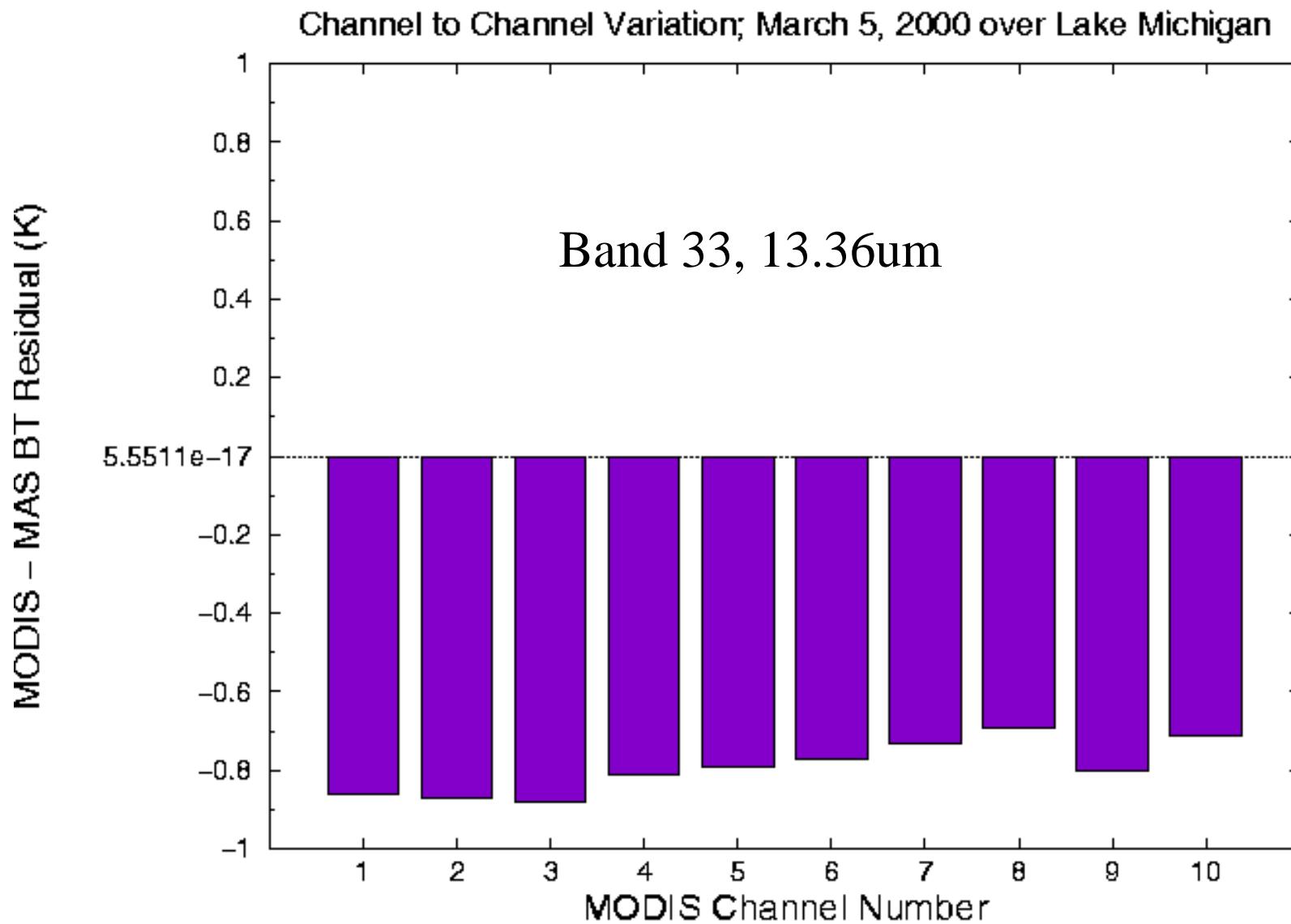
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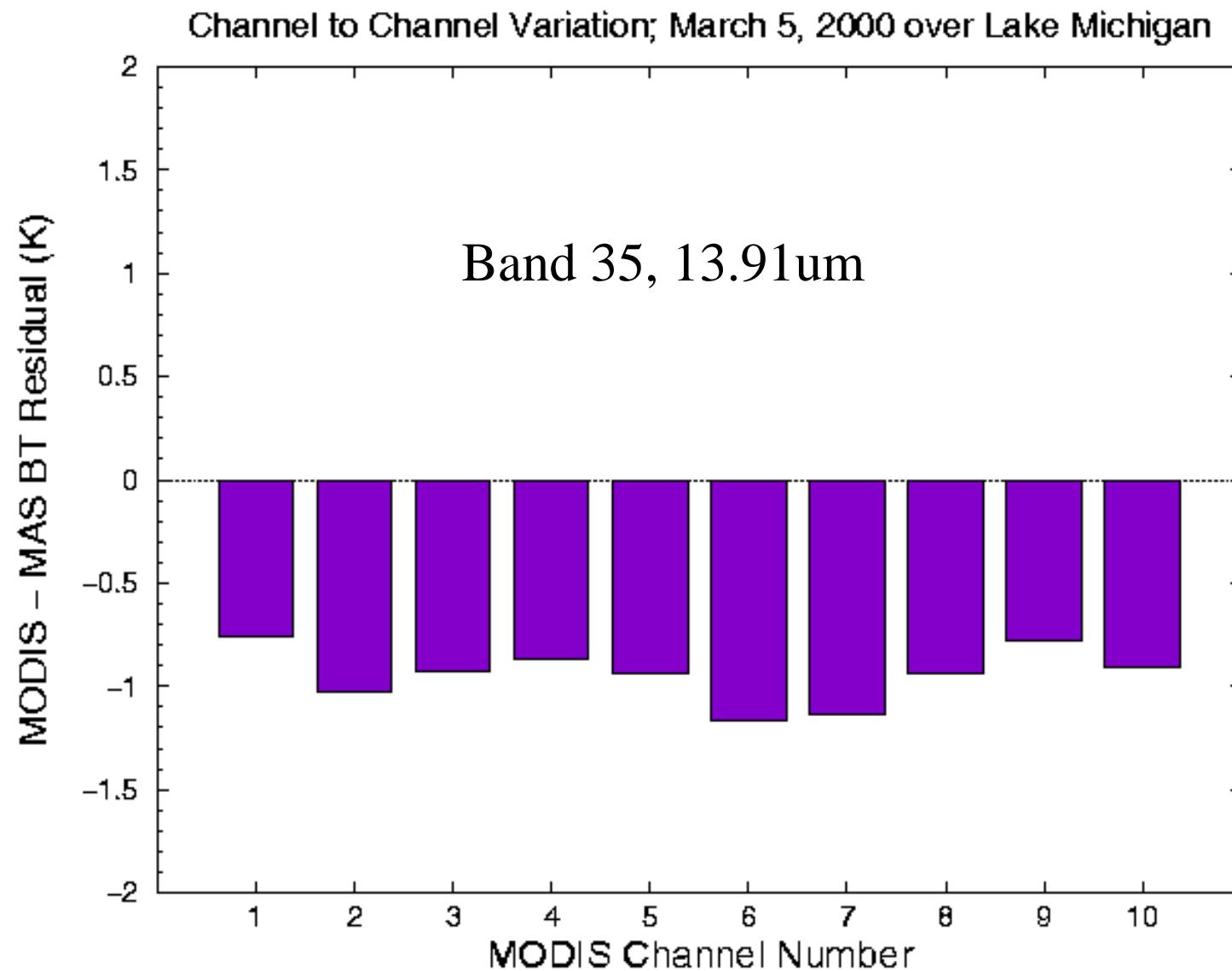
## MODIS L1B Validation; Corrected MAS MODIS comparisons



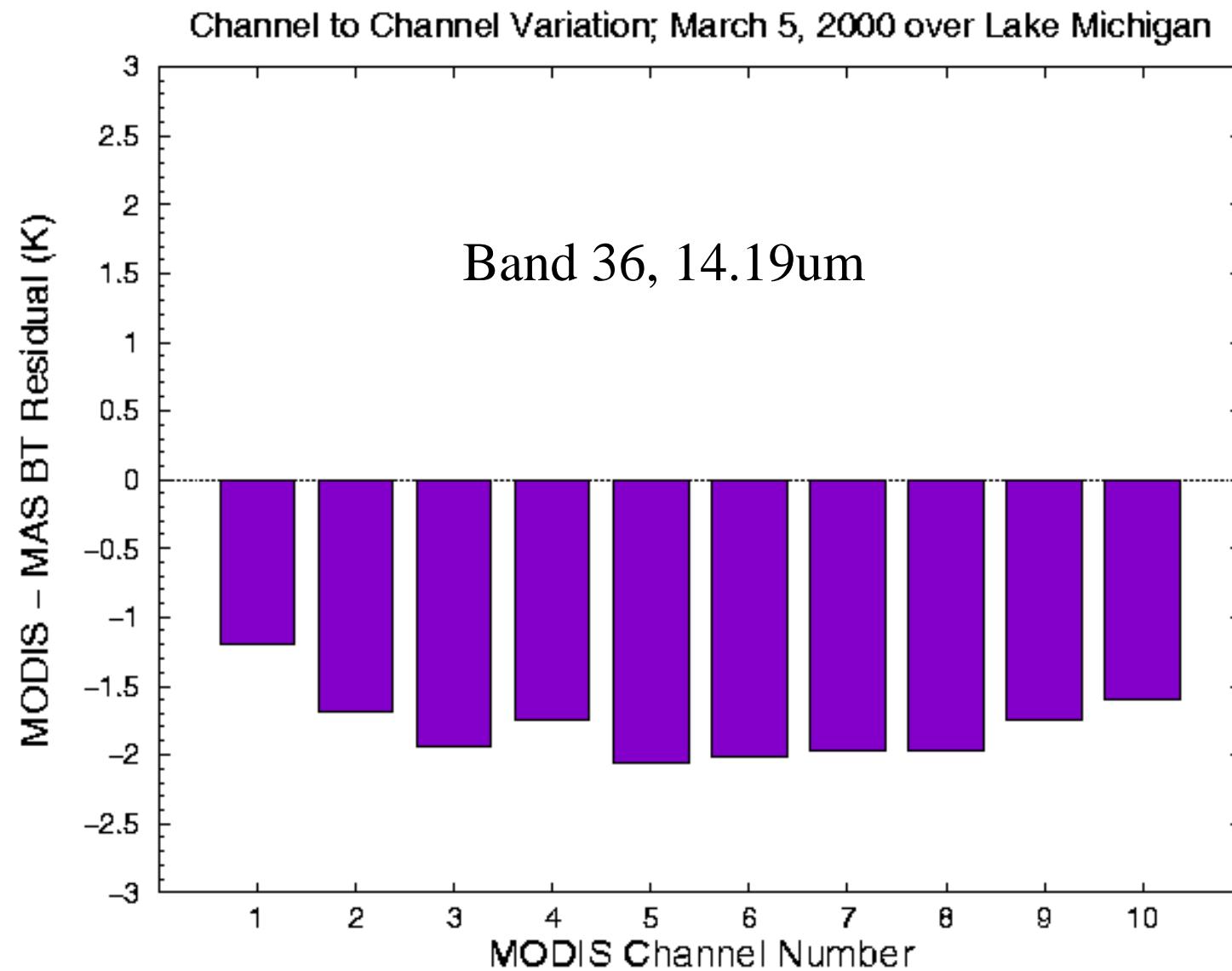
## MODIS L1B Validation; Corrected MAS MODIS comparisons



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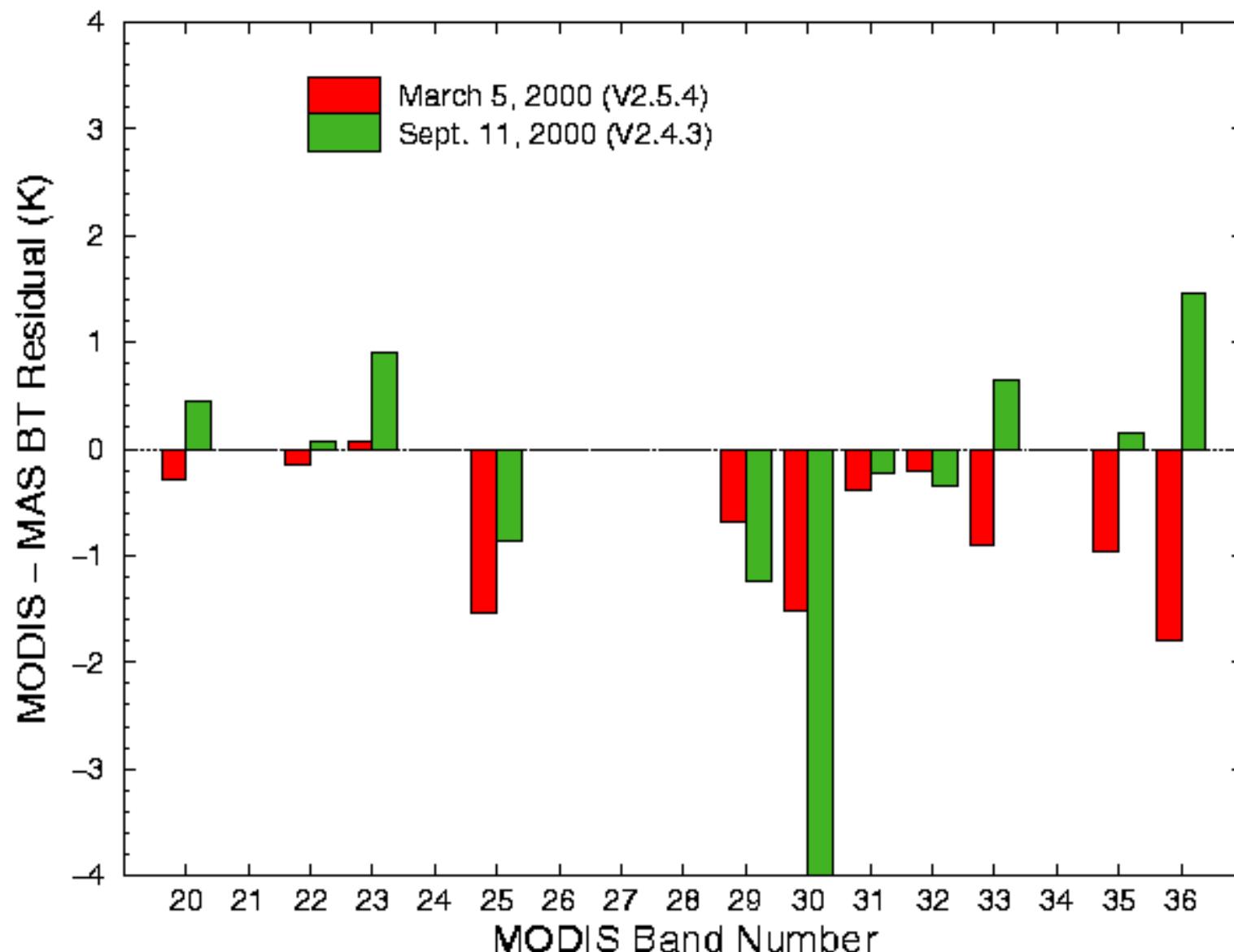


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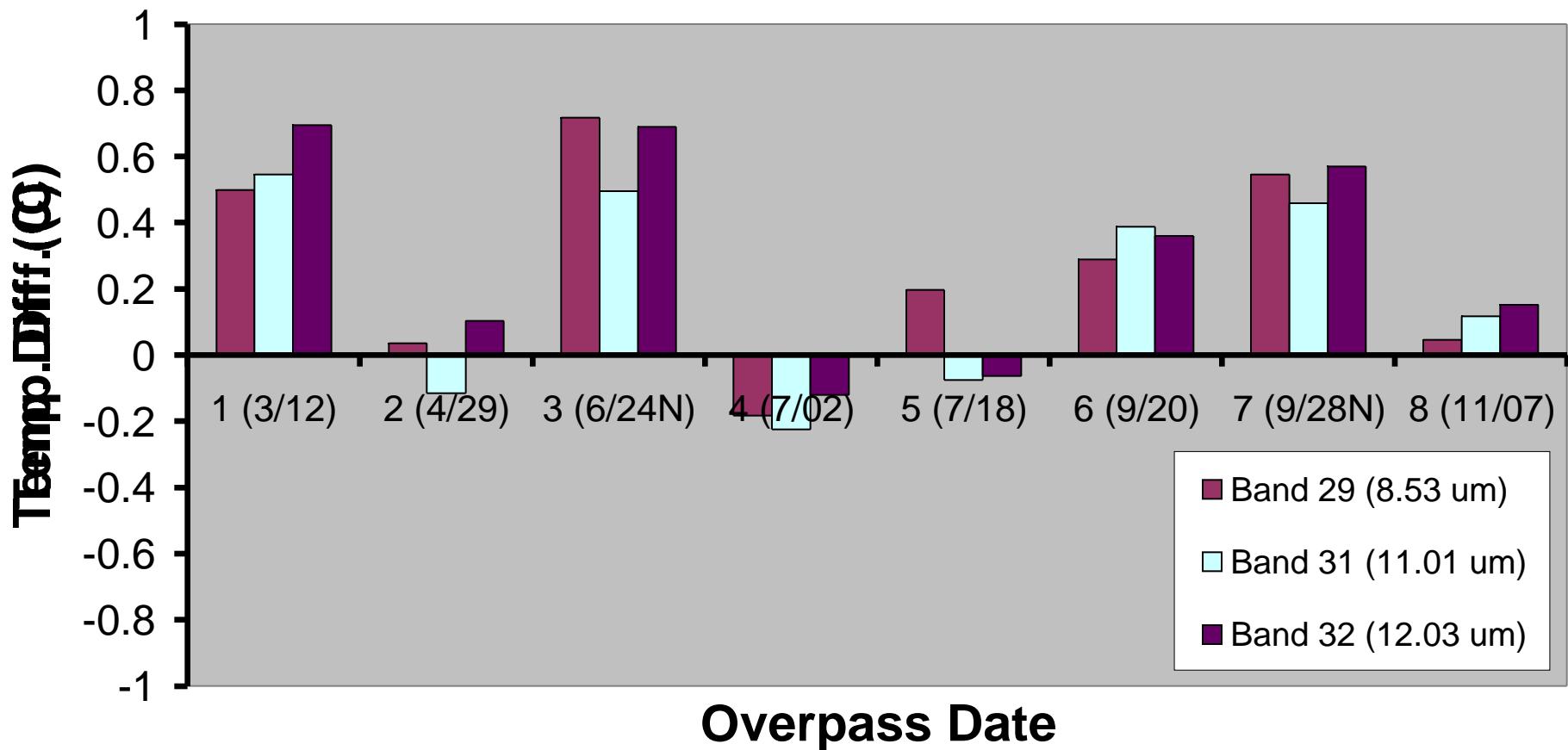


# MODIS L1B Validation; MAS MODIS Comparison History

WISC-T2000 vs. SAFARI-2000 Performance



## Average Temperature Difference between Predicted and Measured Values over Time CY2000 v2.4.3/4



# Summary of Year 1 MODIS L1B ER-2 based TEB Validation

- Small corrections for window bands. Confidence high. Validate to within 0.5°C.
- Atmospheric correction challenging for upper tropospheric O<sub>3</sub> and CO<sub>2</sub> bands.
- 11 and 12um band residual < 0.5°C.
- Decrease residuals with maturing L1B algorithm.
- These results must be considered “snapshots” of performance.